Market Analysis
Program (MAP)

Industry Sector Markets 1988-1993

Federal Government Sector

INPUT®

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DECEMBER 1988

INDUSTRY SECTOR MARKETS 1988-1993

FEDERAL GOVERNMENT SECTOR

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I

Introduction

A

Overview

The federal government's information systems have evolved to provide a wide range of mission support functions, as well as the information processing essential to the federal government's operations. These systems have grown in capabilities and complexity as technological advancements have been incorporated into federal modernization efforts. Further systems will become even more versatile as standards promoting interoperability are implemented and steps are taken to elevate the federal information processing systems to the current commercial technological level.

B

Federal Market Driving Forces

The federal market for information systems is expected to grow at an compound annual rate of 14% over the next five years. This growth will be driven by the goals and objectives listed in Exhibit I-1.

EXHIBIT I-1

FEDERAL MARKET IS GOALS AND OBJECTIVES

- Improve Information Technology Support
- Improve Productivity
- Maintain and Enhance Systems
- Increase Contracting Out
- Overcome Staff Shortages

Government programs require steady improvement in the quality and quantity of information technology support. In its drive to improve productivity—to do more with less—the federal government is growing increasingly reliant on information technology. At the same time, functional and pricing trends—especially in terms of microcomputers and associated software—have opened up new opportunities in government for using technology.

Federal agencies continue a heavy commitment to maintain and enhance existing systems, as well as develop new systems. However, staff shortages effectively prevent in-house performance of these tasks. Further, pressure to reduce the federal budget deficit increases the importance of efficiency and innovation.

The Reagan administration has encouraged the contracting out of many in-house activities, including information systems support. The growing emphasis on OMB Circular A-76, as well as the new Executive Order 12615 ("Performance of Commercial Activities"), emphasizes the bias toward contracting out. At an increasing rate, agencies must use information services firms to take advantage of technology and reach their productivity goals.

Federal personnel policies are also driving an increase in the use of information services vendors. Practically all agency executives that INPUT interviewed cited difficulty in hiring staff with strong technical credentials. In the Washington area, at least, good candidates can frequently obtain higher salaries and better benefits in the private sector than in the government. Thus, many employees with fewer than 15 years of service are leaving government, causing agency executives, usually with more than 20 years of service and looking toward retirement, to contract out most of their technical support activities.

C

Issues for Vendors and Federal Vendor Characteristics

Vendors to the federal information services market identified several characteristics of their products and services that are important in winning federal government contracts (Exhibit I-2). Vendors in several industry sectors assigned importance ratings to these characteristics. Price is viewed as the most important characteristic for winning awards by the software, professional services, and facilities management (also referred to as "systems operations" and "operational support"). Vendors, giving it the highest overall average importance rating. This is due to both the price/performance emphasis of the information services being acquired and the increasing competition throughout industry segments. Vendors are also more aware of the need for government agencies to hold down costs, and they are pricing their products and services accordingly.

EXHIBIT I-2

CHARACTERISTICS OF A SUCCESSFUL INFORMATION SERVICES CONTRACTOR

Characteristic	Vendor Ratings*					
	Software Vendors	Hardware Vendors	Systems Integrators	Professional Services Vendors	Facilities Management Vendors	Overall Average
Price	4.3	3.0	3.9	4.5	4.6	4.1
Federal Contract Experience	3.8	3.4	4.0	3.6	4.2	3.8
Software Development Experience	4.6	3.4	3.9	3.7	3.5	3.8
Integration Experience	4.1	3.3	4.3	3.7	3.3	3.7
Support	4.3	3.3	3.9	3.0	3.6	3.6
Agency Experience	3.2	3.3	3.7	3.6	3.6	3.5
Staff Experience	3.6	2.7	3.7	3.9	3.8	3.5
Application Functional Experience	3.8	2.6	3.7	3.4	3.3	3.4
Hardware Experience	3.9	3.6	3.2	3.0	2.9	3.3

* Rating: 1 = Least Important
5 = Most Important
◯ = Highest Rating for Each Category of Vendor

Hardware experience is most highly rated by hardware vendors, and integration experience received the highest rating by systems integrators. Software development experience also has significant importance to these two industry segments, and it has the second highest overall average rating. Federal contract experience had a rating similar to software, but was highest in importance to the facilities management (FM) vendors. This is probably due in part to the practice of vendors in the FM market-

place building on existing federal contract experience to acquire additional awards. In comparison, agency experience does not get as high a rating; thus vendors may not view their experiences within agencies to be as important as their federal government contract experiences.

The importance to each industry sector of staff experience and application functional experience differed by a greater extent than other characteristics rated in Exhibit I-2, although their overall averages were similar. The highest ratings came from software and professional services vendors, the sectors with more of an end-user/people orientation, while the lowest ratings are from the hardware vendors.

D

Issues for Information Services

The changing environment of the information services markets arises from several key issues that strongly influence both the suppliers and end users in the federal market sector. These issues are listed in Exhibit I-3. These influences will extend into the 1990s.

EXHIBIT I-3

ISSUES FOR INFORMATION SERVICES

- Transition from Data Orientation to Information Orientation
- Changing Acquisition Methods
- Implications of Standards
- Shakeout of Markets
- Price versus Technology

For several years the government has been transitioning from merely processing data to becoming more information oriented. The federal agencies need to be able to readily access, exchange, and store the enormous collection of information that is essential to their operations and to the public. Another evolutionary process in the government is its method of acquiring information systems and services. The emphasis on cost and risk containment has caused a migration to fixed-price contracts and closer scrutiny of procurements.

The 1990s will be a time for implementation of several industry standards for interoperability and compatibility. Transition to POSIX and GOSIP should be progressing since these standards will be made mandatory. Also, further standardization is likely in the areas of communication protocols and system interfaces.

The industry will continue to experience market shakeouts, brought about by a continued consolidation of players, new entrants, and open competition introduced by the Competition In Contracting Act (CICA). Opening the market to an increasing number of vendors in the midst of budget constraints will pose threats to established federal vendors.

The federal government has often stated its preference to award contracts based on the appropriateness of the proposed technical solution. However, in the agencies' struggle to adhere to tight budgets and satisfy congressional oversight, awards for information services are made more frequently according to price rather than the technology. Furthermore, cost constraints are hindering modernization and upgrades of information systems. This is preventing many agencies from realizing the advantages of new technological capabilities to take them into the next decade.

E

Issues for Agency Users

The federal government is using information services vendors primarily because of in-house staffing limitations, budget constraints, and a higher level of available experience and expertise. Exhibit I-4 depicts the issues that concern the federal agency end users, as studied in other INPUT reports.

The most frequently mentioned issue is adherence to industry standards. The administration is seeking to have standards such as POSIX and GOSIP gain a stronger hold throughout the federal government. Another important issue is the level of planning and management skills of contractors. This suggests that vendors need to demonstrate to government end users that they are making a concerted effort to satisfy the agencies' requirements and expectations.

In most cases, the contractor's staff is conducting services deemed important to the federal agency's mission and information system support. Therefore, the experience level of the staff should be appropriate to accomplishing the awarded tasks. Any shortfalls in expertise and skills in the contractor's staff could be a deterrent to achieving those productivity gains that agencies expect through use of contractor personnel. Also, the vendor community is viewed by some government users as not being responsive to their needs. This situation would be improved if better channels of communication were developed between the government officials and contractors.

EXHIBIT I-4

ISSUES FOR AGENCY USERS

Federal Agency Issues	Rank*
Vendor Compliance with Industry Standards	1
Planning and Management Skills of Federal Contractors	2
Level of Experience for Vendor Staff	3
Vendor Cooperation and Responsiveness to Agency Needs	4
Availability of Compatible Software	5

* Rank based on frequency of mention by agency respondents.

Lastly, as agencies have greater pressure to increase productivity and agency resources become further constrained, the government's needs for compatible software will increase. Agency respondents noted a growing need for portable software that is readily adaptable to a changing hardware environment. As new hardware technologies are put in place, the next generation of software must accommodate change and communications between incompatible equipment.

II

Market Forecasts

The U.S. government continues to be the largest user of information technology in the world. More than 120,000 federal workers currently manage approximately 22,000 medium- and large-scale computers and over 300,000 microcomputers. In 1988, nearly $20 billion will be spent on information technology, of which almost three-quarters will be for contracted products and services.

Virtually every major federal program depends on productive use of information technology for its success. Not only is information more available today than even five years ago, it is more widely dispersed.

Early in the computer age, the federal government far outdistanced the private sector in development and use of information technology. Federal agencies developed automated information and service delivery systems early on, initially for defense and later for civilian applications.

However, by the late 1970s, the federal government lost its leadership position in computer applications. Its inventory consisted largely of outdated, cost-ineffective systems. The change occurred as a result of the following factors:

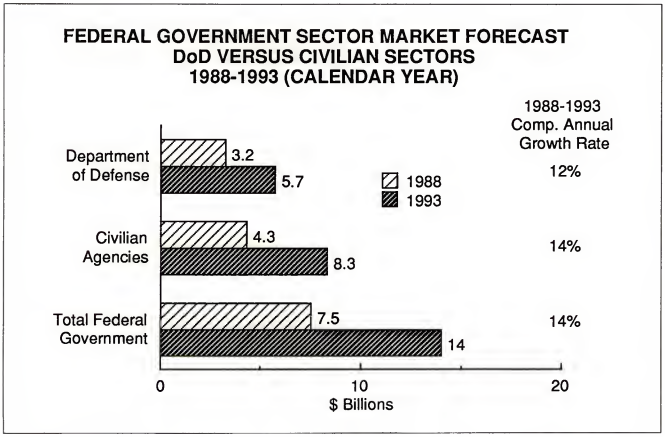
- A highly concentrated, overregulated procurement process
- Frequent changes in leadership, leading to changing priorities and volatile resource levels
- Personnel policies that drove many of the needed technical personnel out of government

Despite the worsening of these conditions, the government has initiated many major projects to modernize its information systems. The projects underway and on the drawing board will alter many of the ways in which the government functions.

The industry-specific contracted portion of the federal information systems budget will grow from $7.5 billion in fiscal year 1988 to $14.0 billion in fiscal year 1993, a compound annual growth rate (CAGR) of 14% (Exhibit II-1). Both the defense and civil sectors show roughly the same growth rate. This represents a larger increase in civilian growth rate and a small increase in defense growth rate from last year's forecast. The lower increase in growth rate for the defense department reflects the reduction, in inflation-adjusted dollars, of the overall defense budget. The larger increase in civilian growth rate reflects the expected long-term realization of several major civilian initiatives, including:

- Modernization at the Social Security Administration
- The FAA's Aircraft Avoidance System
- The congressionally mandated growth of GSA's FTS 2000 telecommunications procurement

EXHIBIT II-1



As in the other INPUT Vertical Industry reports, INPUT focuses on six key delivery modes (Exhibit II-2). The remainder of this chapter discusses these delivery modes, with comparisons of DoD and civilian markets in each delivery mode. Exhibit II-3 breaks out the six delivery modes for the defense sector, and Exhibit II-4 does the same for the civilian sector of the federal government.

EXHIBIT II-2

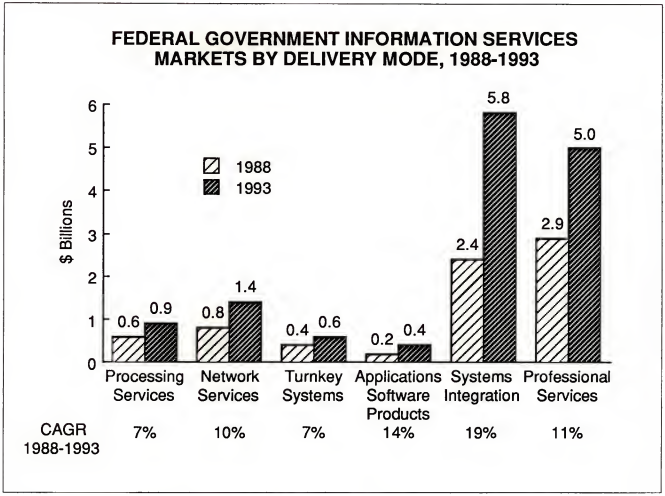


EXHIBIT II-3

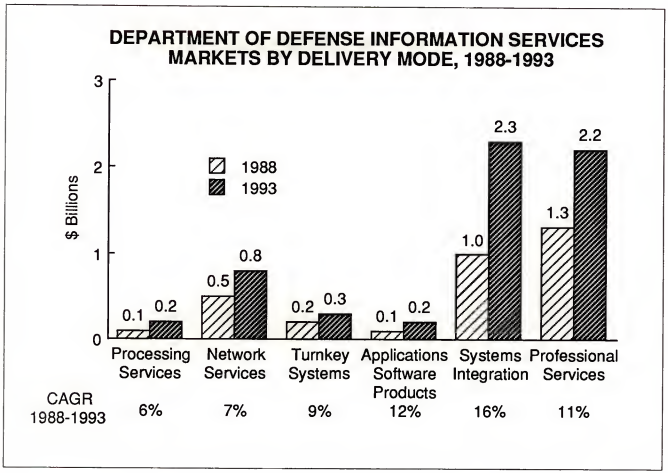
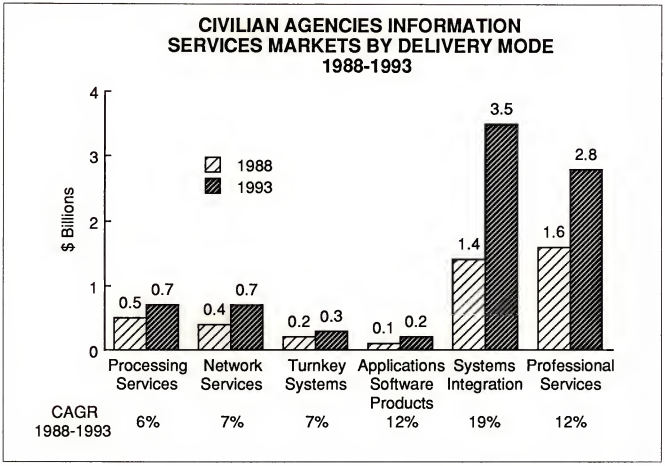


EXHIBIT II-4



A

Processing Services

Processing services includes remote/batch processing services and systems operations of vendor-owned systems. Over the past few years, the growth rate for processing services has shown some decline. However, the current forecast shows a leveling of this growth rate.

For several years, the growth of microcomputers caused a dampening of demand for processing services. Now, however, these micros are connecting into vendor-owned computer systems, downloading data, revising and displaying it in various ways, and uploading it back to the mainframes. Since INPUT removed transfer payments from the Health Care Financing Administration (HCFA) in last year's report, this year's cut in HCFA grants had no effect on the forecast.

The demand for processing services in the civilian sector is more than four times as large as that of the defense sector. This difference occurs primarily as a result of the Department of Energy and NASA, which make heavy use of vendor-owned facilities management arrangements.

This is partly tradition, but it also reflects the difficulty these two agencies face in recruiting the technical talent to staff their scientifically oriented computer centers.

B

Network Services

Network services consists of:

- Value-Added Network Services (VANs)
- Electronic Mail
- Electronic Data Interchange (EDI)
- Electronic Information Services, including data bases, news, and videotex

Like processing services, network services will grow 6% annually, but from a larger base. In this case, the defense sector represents a slightly larger market than the civilian sector, reflecting the far flung nature of DoD operations.

Again, the growing acceptance of microcomputers, which earlier retarded this market, is now enhancing it. As federal users become more sophisticated and demanding in using micros, fewer leave their micros in a standalone mode. Rather, in addition to accessing computer centers, as discussed in Section II A, they also access public and private data bases and news services, using VANs to link with a wide variety of products and services. In this way, microcomputers are spurring the growth of the federal network services market.

EDI is receiving much attention in the government. Although its growth in the federal market lags that in the private sector, it is still becoming quite popular. INPUT expects that in the early 1990s EDI will account for a major portion of network services growth. Unlike most other delivery modes, EDI prospects are actually enhanced by budget cuts. Federal managers can save much of their administrative expense by reducing paperwork. Greater automation of procurement, invoicing, human resources, and other administrative functions through EDI will reduce expenses and increase accuracy and efficiency.

C

Turnkey Systems

Turnkey systems are value-added packaged hardware and software solutions to specific applications requirements that satisfy, with few modifications, commercial, industrial, and government needs. In this delivery mode, the defense sector is growing slightly faster, although from a smaller base.

Scientific and engineering applications represent the largest area of turnkey system usage. These include CAD, CAG, CIM, and data collection packages. On the civilian side, NASA and Energy have the greatest need for these systems and support most of the civilian growth. Defense also has growing requirements in this area.

Document handling represents the second largest application area. This includes, among other applications, DoD's initiatives on CALS (Computer Aided Acquisition and Logistics Systems). The higher growth in the Defense sector is due in part to the growth of CALS. Other document-handling applications include library, graphics, mapping, and publishing systems.

Other turnkey applications include:

- Human resources
- Fleet scheduling
- Maintenance tracking
- Medical drug information
- Financial systems

D
Systems Integration

In some respects, systems integration is similar to turnkey systems. They both typically involve equipment, packaged software, and customized software. However, systems integration is generally oriented towards bringing together a large number of diverse systems, whereas the turnkey business is more oriented towards development and installation of a single application that requires little or no customization to be useful in a large number of organizations.

The systems integration market growth is due to a variety of factors:

- Federal personnel policies have driven most technical experts out of government, leading to greater reliance on the private sector.

- Heavy commitment of the available federal work force to maintaining existing systems has emphasized the need to reduce life cycle maintenance costs by introduction of more efficient software and more reliable hardware, customized in a systems integration mode.

- A continuing increase in the ratio of federal software-to-hardware costs has lent emphasis to the utilization of more efficient, commercially designed and developed information systems.

- Federal agencies have sought to increase risk sharing with their vendors through a systems integration approach.

Although the civilian sector starts from a larger base, INPUT expects it to grow slightly faster than defense. This is based primarily on the programs identified in agency long-range plans, rather than any distinctive trends between civilian and defense agencies. In general, the defense agencies have identified more major but lower-valued initiatives requiring systems integration support.

E

Applications Software Products

Civil agencies will spend slightly more than defense on applications software products, although both sectors will grow at the same rate.

As a result of budget constraints and heavy pressure from OMB, many agencies are beginning to view their requirements in other than unique terms. When they have a fairly standard application, particularly an administrative application, they are acquiring standard packages more often than ever before. This has led to an increase in packages suitable for government use as well as an increase in government-oriented marketing efforts.

One area receiving much attention is standard financial packages. The Joint Financial Management Improvement Program (JFMIP) has issued a Core Financial System Requirements document for agency use. In connection with this JFMIP requirement, GSA has issued contracts to Computer Data Systems, Inc. and American Management Systems for certain Core compliant software. INPUT expects more than a dozen additional vendors to be approved for Core compliant software when GSA reissues the solicitation in about a year.

As the Reagan administration winds down, its Reform '88 initiatives to make the government more efficient are beginning to show major impacts in several areas. The federal applications software market is benefiting from this trend. Among other things, Reform '88 dictates resource sharing. This too has discouraged unique customized software development. As a result, INPUT expects the growth in applications software products to continue to exceed overall market growth for the foreseeable future.

F

Professional Services

Professional services includes consulting, education and training, software development, and systems operation of client-owned facilities. It no longer includes the professional services portion of systems integration, as it did in last year's report. This has been reclassified as part of the systems integration delivery mode. As a result, the totals in this category are considerably lower than they were last year.

The civilian sector started from a higher base in 1988 and grew slightly faster than defense. As previously discussed, both NASA and the Department of Energy have traditionally relied on private-sector profes-

sional services to a greater extent than most other agencies. This situation, combined with periodic legislation aimed at discouraging defense from contracting out, has held down the defense number.

1. Programming and Analysis/Software Development

Programming and analysis services, also called software development, include:

- Hardware and/or software system design
- Custom software development
- Modification of commercial software products
- Software testing of custom and commercial packages
- Software conversion
- Maintenance of operating and applications software
- Independent verification and validation (IV&V) of software packages prepared by other vendors

This service mode is expected to grow rapidly during the forecast period and is the largest submode in professional services. The current and continuing shortfall in programming skills of the federal government sector is the most significant factor behind the projected growth. Government staffing limits and the backlog of software maintenance tasks of most government data centers also contribute to the demand for vendor assistance in this service mode.

There is a commitment to maintain and increase the effectiveness of existing software. The major trend, as discussed above, will be to buy more off-the-shelf packages and use professional services to modify the packages to suit unique needs.

This segment will remain strong until the agencies retrain or replace their current staffs and resolve the software maintenance problems associated with earlier custom software practices and manual software development procedures.

2. Consulting Services

Consulting services in the federal market provide support to information systems and/or services. Examples of government consulting service contracts are:

- Feasibility studies
- ADP requirements analyses
- Systems audits
- System Engineering and Technical Direction (SETD)
- System Engineering and Technical Assistance (SETA)

The primary growth factor is the need of agencies for assistance in producing the technical justification for planned improvements in information technology resources during this period. The agencies are understaffed in the technical planning and evaluation areas.

3. Education and Training

Education and training services relate to information systems and services for the user, including computer-aided instruction (CAI), computer-based education (CBE), and vendor instruction of user personnel in operations, programming, and software maintenance. The government normally contracts for the following separately from systems integration programs:

- Training programs
- Books and manuals
- Seminars
- Automated training systems

The principal focus of training will be the large number of fourth-generation replacement systems of ADP architectures of the IBM System 360-370 era. The dynamics of end-user computing, local-area networks, distributed processing, and new software will require retraining of more than half of the current agency ADP work force, reversing the earlier (1986) reductions. The Gramm-Rudman-Hollings Act cuts heavily affected agency education and training budgets.

4. Systems Operations/Operations and Maintenance

Professional Services Systems Operation (PSSO) is also referred to as government owned/contractor operated (GOCO). GOCO also includes standalone operations and maintenance (O&M) contracts, which differ from PSSO in that they have less or no direct management/control of the facility. The computing equipment is owned or leased by the government, not the PSSO or O&M vendor; the vendor provides the staff to operate, maintain, and manage the government's facility. Typical contract tasks include:

- Operation, maintenance, and management
- Operation and maintenance
- Hardware maintenance
- Third party maintenance

- Software maintenance
- Site preparation and installation

This submode is considered a mature market in the federal government, with limited growth prospects. Third-party maintenance activities will increase, however, as more agencies turn to competitive approaches to increase competition and better comply with the Competition in Contracting Act.

III

Competitive Developments

A

Market Considerations

1. Market Characteristics

Vendors of information services and software to the federal government may be categorized by their exclusivity with federal clients.

- At one end of the continuum are firms that work almost exclusively on federal contracts. Many of these are small firms that have expertise in such services as design and engineering or are known for their "body shop" programming and analysis capabilities. This group also includes several major not-for-profit firms, colleges and universities, and in-house government data centers with excess capacity, all of which compete with commercial federal contractors.

- The middle group on the continuum tends to be very large contractors that have very large and separate commercial and federal operations. Although some of these vendors provide a single type of service, most are capable of providing full service, either by themselves or in concert with one or more partners.

- At the other end of this continuum are vendors that have a federal presence, but whose presence is secondary to a commercial line of business. That is, these vendors contract with the federal government because of a capability, not because they have a priori selected the federal marketplace.

Most of the largest vendors to the government are part of the middle group. They derive a significant percentage of their total information systems revenue either directly from the federal government or as subcontractors to other companies performing work under government contracts. This dependency upon the federal government has had a profound effect upon vendors' earnings, management, organizational structure, employees, and the commercial market.

These government vendors, as well as larger vendors in the first group, tend to attract and recruit into their management ranks a high proportion of ex-government employees who understand how to navigate the complexities and deal with the competitiveness of government procurements. Many of the leading vendors in the industry then tend to establish a federal marketing group that handles their government operations. The industry vendors surveyed reported having anywhere from 20 individuals to over 7,000 employees in their federal operations.

The market sales cycle for the federal market is lengthy. Many vendors target large systems two years in advance, while smaller programs might take eight months to market after they are announced in the Commerce Business Daily. The majority of the industry respondents noted that procurements have become lengthier due to closer examination of procurement practices and potential protests of the awards. Also, there is some development of long-term relationships and more trust among competitors due to greater involvement in teaming and subcontractor arrangements.

2. Key Applications and Technologies

Several key applications and technologies will have an impact on the information systems market over the next few years. The industry respondents ranked factors they view as most significant to the federal market (Exhibit III-1). Information management is viewed to be the leading application driving the government's use of contracted services. The federal agencies will continue to modernize their information systems to enhance both the accessibility and management of information as part of their efforts to be more efficient and productive.

The federal agencies have planned major telecommunication initiatives for implementation over the next five years, which will stimulate demand for vendors' products and services. Also, the proposed revisions of agency telecommunication policies and new standards that are being developed and implemented are impacting these future telecommunications acquisitions and will serve as controlling criteria for selection of voice and data systems and services. Furthermore, the government is increasing its use of local-area networks (LANs) to handle the distribution and sharing of information both within agency organizations and externally. LANs being developed will incorporate agency requirements for higher data speeds and increased accuracy in their technical design.

At present, federal information systems primarily support financial and administrative applications. The large volumes of invoices, payments, transfer of funds, and administrative processes in the government require that information systems be efficient and highly cost-effective so that agencies can accomplish their missions through use of their allocated computer resources. As the government acquires additional computing

EXHIBIT III-1

KEY APPLICATIONS AND TECHNOLOGIES

Application/Technology	Rank*
Information Management	1
Telecommunications	2
Financial and Administrative	3
Local-Area Networks	4
Secure Networks	5
Electronic Services	6

* Rank based on frequency of mention by industry respondents.

power and information systems expand, technical and scientific applications will be developed.

Throughout the government there is increasing acquisition of TEMPEST-tested and related electronically secure hardware and software. Civil agencies are awaiting new computer security guidelines from the National Security Agency and the National Institute of Standards and Technology (NIST, formerly the National Bureau of Standards). Security and privacy issues associated with personal computers have not yet been uniformly addressed across the federal government, but progress is being made since the passage of the Computer Security Act.

Electronic services such as electronic mail and Electronic Data Interchange (EDI) will gain in usage and be adapted for additional applications in conjunction with the government's goal of reducing the paper burden. Already the DoD and various civil agencies have developed programs based on electronic services.

As future technologies are made available, the role of electronic services will become more critical to agency mission support functions and government operations.

3. Market Growth

INPUT's survey revealed that in all but two categories of contracted services, a majority of industry respondents expect an increase in the amount of services to be acquired by the government over the next five years, as shown in Exhibit III-2. The largest increases anticipated are in systems integration and professional services, where expected increases in revenues were estimated at 25%. Vendors foresee a 10-25% increase in revenues for network/electronic information services.

EXHIBIT III-2

VENDOR-PROJECTED CHANGES IN INFORMATION SERVICES CONTRACTING OVER THE NEXT FIVE YEARS

Delivery Mode Segment	Proportion of Respondents (Percentage)		
	Expected Increase	Expected Decrease	No Change
Professional Services	68	16	16
Processing Services	16	34	50
Application Software Products	40	20	40
Network/Electronic Information Services	50	16	34
Systems Integration	68	16	16
Turnkey Systems	34	—	66

Forty percent of the vendors surveyed view the government's increased use of packaged software as not hindering the professional services market, while the same percentage see the market increasing 15% to 25%. The respondents were of the opinion that there will still be ample opportunities for modification, installation, training, and integration of software by professional service vendors. Furthermore, vendors have

commented that the federal agencies do not have the necessary in-house expertise to perform many of the software-related services.

B

Leading Federal Vendors

This section lists the leading federal vendors in each of the six delivery modes. This information was derived from the following sources.

- Federal Procurement Data Center
- Interviews with agency and vendor officials
- Press accounts of various contract awards

In general, the leading players did not change much from last year's report, except in new delivery modes not included last year. It is becoming increasingly difficult for new firms to gain a major share of the federal information technology market. As a result, some consolidation is occurring. Many leading outside firms, including Ford Aerospace, Emhart, and Cincinnati Bell, have bought smaller firms with heavy federal penetration.

1. Processing Services

The federal market for processing services has become very stable in response to organizational, technological, and strategic changes. It is definitely not a growth industry, since its CAGR trails far behind all of the other delivery modes and is expected to decline in the next decade. It still represents an opportunity for current vendors to recover investments but offers no real ROI for newcomers.

The ten leading processing services vendors in the federal market for calendar year 1987 are ranked in Exhibit III-3. The market remains fairly concentrated, with the top ten vendors accounting for approximately 80% of the agency expenditures. The key changes include CSC's replacement of BCS as the leading revenue earner for the first time in more than five years, and the shuffling of the order of the midrange vendors. As noted above, the federal market continues to experience some consolidation. Several leading processing services vendors have acquired smaller vendors and their contracts, thereby increasing their share of the market.

All of the leading vendors offer at least two of the following three processing submodes.

- RCS
- Remote batch
- Operations support (previously Facilities Management)

Like other federal market areas, the processing services market has become more price sensitive. In many cases, agency workload has gone up without a corresponding budget increase. The trend is to buy raw

EXHIBIT III-3

RANKING OF TOP FEDERAL PROCESSING SERVICES VENDORS

Company	Rank*
CSC	1
Boeing	2
CDC	3
McDonnell Douglas/Tymshare	4
MMDS	5
GE Information Systems	6
AMS	7
Comnet	8
DRI	9
ITT Dialcom	10

* Based on 1987 annual revenues

computing power under the Basic Agreements, rather than the more expensive, technically supported Multiple Award Schedule Contracts (MASC).

Although contract audits will continue, some profit opportunities will remain, especially when the government fails to size its peak workload properly.

A vendor may offer heavily discounted rates within a specified workload window. However, if the government dramatically exceeds this window (as often happens), rates may rise to commercial levels. Theoretically, an audit of the charging algorithm will eliminate unbalanced charges. However, opportunities for high profits will continue to be available in specific situations.

2. Network/Electronic Information Services

The top ten network services vendors are listed in Exhibit III-4. In 1987, AT&T accounted for 42% of the market. Together, the top ten vendors accounted for 77% of the market. This has changed little over the past few years. In fact, most of the top ten vendors ranked high over the past four years.

EXHIBIT III-4

RANKING OF TOP FEDERAL NETWORK SERVICES VENDORS

Company	Rank*
AT&T	1
Boeing	2
Contel	3
Bell Atlantic	4
General Electric	5
U.S. Transmission Systems	6
U.S. West	7
GTE	8
Foreign Carriers Communications	9
Southwestern Bell	10

* Based on 1987 revenues

INPUT expects AT&T to continue to dominate the network services market. However, the other shares are expected to change following the award of FTS 2000. The winners in this contract will provide the media and support for both network services and electronic information services.

The nature of the overall federal telecommunications market is also changing in response to increasing data and facsimile demand, especially for higher speeds and distributed data needs. This will have a significant effect on the network services market. Vendors with specialized capabilities in such areas as EDI and Videotex will continue to profit in this market.

3. Turnkey Systems

This market is usually associated, at least in the federal market, with specialized applications in particular niche areas. As a result, the federal turnkey systems market is considerably smaller than that for systems integration. The leading vendors (Exhibit III-5) tend to be smaller firms that focus on specific government needs. Some of the vendors specialize in defense systems. Also, practically all the vendors provide specially adapted equipment modified to satisfy unique system requirements.

EXHIBIT III-5

RANKING OF TOP FEDERAL TURNKEY SYSTEMS VENDORS

Company	Rank*
Federal Data Corporation	1
C3, Inc.	2
Computervision	3
Prime	4
Intergraph, Inc.	5
Computer Consoles	6
Gould	7
Harris	8
Tektronix	9
Triad	10

* Based on 1987 revenues

Some vendors focus on a handful of agencies, providing CAD/CAM products to support defense and energy-oriented needs. On the other hand, graphics and drawing control systems have wide applications across a number of areas. Although training systems are heavily concentrated in defense and NASA, other agencies are now experimenting with trainers and simulators.

4. Applications Software Products

As might be expected, federal industry-specific applications software products represent the smallest of the six delivery modes covered in this report. Further, the market is also the least concentrated. Even the leading firms (in Exhibit III-6) account for a very small portion of the market. In keeping with INPUT's classifications of delivery modes, this delivery mode includes only government-specific software products, and not those used in cross-industry applications.

EXHIBIT III-6

RANKING OF TOP FEDERAL APPLICATIONS SOFTWARE VENDORS

Company	Rank*
Computer Associates	1
Sterling Software	2
Computer Corporation of America	3
Universal Energy Systems	4
Government Technology Services	5
Q S Inc.	6
Integrated Software Systems	7
Macheal-Schwendler Corp.	8
Candle Corporation	9
Computer Data Systems, Inc.	10

* Based on 1987 revenues

Federal agencies buy about 40% of their software, leasing the rest. Defense agencies and GSA usually put more emphasis on software maintenance than other federal agencies. Further, some agencies oppose acquisition of copyright-protected software.

Qualification for the GSA Federal Supply Schedule permits direct agency purchases of software, up to the schedule's maximum order limitation. To qualify for the schedule, vendors must usually offer discounts as large as those received by the vendor's "best customer," including foreign clients. Further, in most cases, the vendor must offer a purchase plan or permanent site license after a specified rental period.

5. Professional Services

Since the federal government is the largest consumer of professional services, it attracts the widest range of vendors. As listed in Exhibit III-7, system houses and hardware firms dominate this market. These firms require a broad range of in-house or consultant skills to meet systems integration and implementation requirements. In a departure from previous years, hardware firms are starting to provide the products and services of other firms, where appropriate, to meet the clients needs.

In fact, virtually all professional services firms team with other firms in responding to major federal solicitations. Therefore, competition among the firms is becoming complicated by the continually changing teaming patterns. Professional services firms typically team on one project while competing simultaneously on another.

In devising bidding strategies for professional services firms, the availability of key project managers and technical specialists becomes paramount. In DoD, particularly, agencies want project managers who are familiar with the agency. Retired military officers often make good project managers, at least in terms of proposals. However, the retired officers need to learn the culture of the contractor. For example, a federal project manager would typically want the best people available. However, this is not the case among contractors, where a project manager cannot afford the best people available. Rather, he or she needs to leverage the senior talent and use primarily junior, less expensive people.

Some other characteristics of this market include:

- Increasing use of fixed-price bids
- Client-directed use of subcontractors, such as Big Eight accounting firms

EXHIBIT III-7

RANKING OF TOP FEDERAL PROFESSIONAL SERVICES VENDORS

Company	Rank*
Computer Sciences Corporation	1
Unisys	2
General Motors (Hughes)	3
IBM	4
Martin Marietta	5
Honeywell	6
Boeing	7
Lockheed (LEMSCO)	8
Planning Research Corporation	9
General Motors (EDS)	10

* Based on 1987 revenues

- Growing importance of corporate reputation
- Use of software development tools, especially programmer and analyst workbench tools

6. Systems Integration

Given the size and growth in the federal systems integration (SI) market, it is not surprising that the competition is fierce. Some vendors compete in several categories because they offer products and/or services over various commercial and government market sectors, including:

- Specialized integrated systems
- Midsize microcomputer-based systems

- Midsize microcomputer-networked distributed data systems
- Large CPU-based systems with or without distribution networks
- Supercomputer systems

In this latter category, the systems frequently function as hosts for several mainframes, which in turn support distributed midsize computers and microcomputer terminals.

The top ten SI vendors (Exhibit III-8) are all well-known companies in the federal information systems marketplace.

EXHIBIT III-8

RANKING OF TOP FEDERAL SYSTEMS INTEGRATION VENDORS

Company	Rank*
Electronic Data Systems	1
Computer Sciences Corporation	2
IBM	3
Unisys	4
PRC	5
MMDS	6
Federal Data Corporation	7
TRW	8
Digital Equipment Corporation	9
Boeing Computer Services	10

* Based on 1987 revenues

C
Competitive Factors

1. Industry Influences

Most of the federal vendor community are optimistic in their outlook for the information systems market. However, some recent industry events and trends need to be given consideration in developing marketing strategies for the 1990s. In spite of the previous moratorium on defense spending, vendors foresee continued defense outlays for renewals/upgrades of older systems. The larger systems and future acquisitions will be subjected to closer scrutiny by both oversight agencies and the Congress.

Vendors are also becoming concerened that the trend among federal agencies to consolidate contracts may eliminate some of their prospects for new projects and recompetition of existing programs. However, these larger contracts have also brought about additional subcontracting and teaming opportunities. In addition, recently there has been a shift toward re-examining "Grand Scale Design" procurements to form smaller modules in order to reduce the risk to the government.

Another factor is the upcoming change of administration. Department of Defense expenditures will most likely be trimmed if the new administration is more aggressive in attacking deficit spending. If a shift to civilian agency spending occurs, the civilian programs such as the IRS Tax Redesign, some NASA space programs, and the Social Security Agency Modernization could be given increased priority. Following the election, there will be some changes in policies and delays in procurements, but for the most part it will be business as usual as the new personnel become familiar with the information systems programs.

2. Recommended Strategies

Vendors to the federal government must resign themselves to the fact that, while program managers may prefer incentive contracts, most contracting officers still prefer to do business on a fixed-price basis. Vendors must find, and put into practice, methods of pricing and managing professional services contracts that allow them to minimize the risk of performance on a fixed-price basis, or they will not be able to compete successfully in the government marketplace. To minimize costs and remain competitive, vendors must make maximum use of automated tools to increase their productivity.

Vendors should vertically penetrate potential agency customers to better understand the agency mission and functions and to solve the agency problems, not modify the problem to meet an available solution. Much can be accomplished by stressing the benefits to the customer, rather than the benefits of the service. This is particularly relevant in the area of systems integration.

Vendors should be aware that, especially in the civil agencies, their reputation is an important factor in whether they can win work with an agency. The government is a "small community," and a questionable reputation in one agency can impede getting work in another. Overcoming a "poor" reference can take a long time. It is extremely important that vendors regularly and systematically survey their agency customers to determine problems, satisfaction levels, trends, and opportunities.

Furthermore, any product or service that stresses standards or interoperability will likely be attractive to the government. Vendors should exhibit to the federal agencies their ability to comply with specified standards and their awareness of the latest technology. Also, vendors need to show that they have the specialized expertise and personnel to supplement the agency's in-house staff.

3. Industry Activities

a. Open Software Foundation Established

In May, 1988 the Open Software Foundation (OSF) was formed by several computer companies as a nonprofit that will work to develop a standard UNIX operating system. The founding sponsors include Apollo Computer, Inc., Digital Equipment Corporation, Group Bull of Paris, Hewlett-Packard, IBM, Nixdorf Computer AG, and Siemens AG. The organization aims to have an operating system standard available for licensing by 1990.

The currently proposed OSF standard would be built on a modified version of IBM's AIX operating system and would support the Berkeley extensions to UNIX. Included in the system developments will be a user interface, procedures for interoperability, and validation tests. OSF issued its first technological request for user environment standards and is awaiting vendor responses.

The resolution of the OSF versus AT&T differences is especially important in the federal market, as a result of the push toward interoperability in general and the POSIX standard in particular. INPUT expects the OSF to develop POSIX-compliant products, in order to secure a foothold in this growing federal market. At this writing, AT&T, Sun, Unisys, and others opposed some OSF activities, and have formed UNIX International as an opposing force to OSF. AT&T's victory in the Air Force AFCAC 251 procurement may strengthen this position.

b. U.S. Postal Service—Perot Contract

One of the most widely publicized federal contract disputes was the Postal Service's June 1988 sole source-contract to Perot Systems Corporation for studies to develop ways to streamline the Postal Serv-

ice's operations. The $500,000 award for Phase I was protested to the General Services Administration's Board of Contract Appeals (GSBCA), by EDS and PRC, which claimed that the award was in violation of the open competition provisions of the Brooks Act and other federal procurement regulations. Following the protest, Perot Systems and the Postal Service asked the federal appeals court to dismiss the protests on the grounds of lack of jurisdiction. The Congress also directed the GAO to investigate the controversial award.

In early August, the GSBCA decision stated that the Board had jurisdiction and declared the contract void due to violation of the Brooks Act and the Postal Service's regulations. GSBCA also concluded that favoritism had been shown to Perot Systems. The U.S. Court of Appeals for the Federal Circuit ruled in September that the Postal Reorganization Act of 1970 excluded the Postal Service from the reach of all federal procurement laws and asserted that the GSBCA lacked jurisdiction and therefore, the protests should be dismissed. The court ruling is viewed as likely to provoke legislative actions, including the possibility of amending the federal procurement acts to bring the Postal Service into their jurisdiction. Even before the court ruling, the Postal Service had agreed to open competition for the implementation phase of the Perot contract and to bar Perot from participation in that phase.

4. Acquisitions

Cincinnati Bell entered into the federal market via its July 1988 acquisition of Vanguard Technology. Vanguard is to become a subsidiary of Cincinnati Bell Information Systems (CBIS). Cincinnati Bell views the action as extending its telecommunications knowledge and experience in the area of federal information.

Two professional services companies were bought by Emhart, a multibillion-dollar industrial company that extended its business operations into the federal government arena. Emhart first acquired Planning Research Corporation, a professional services firm in McLean, Virginia, at the close of 1986. It then purchased Advanced Technology, another professional services firm, in Reston, Virginia, in the fall of 1987. The combined federal experience and expertise of these two companies makes Emhart a strong contender in the federal information services market.

In another acquisition typical of the federal market, Ford Aerospace acquired BDM Corporation in 1988. Although Ford, unlike Cincinnati Bell and Emhart, already had significant government business, the acquisition of BDM enabled Ford to dramatically expand its presence in this area.

INPUT expects continued merger and acquisition activity in 1989. In particular, large commercial companies with little federal business will likely find it more cost-effective, and certainly faster, to buy market penetration rather than developing it through competitive marketing.

IV

User Issues and Directions

A

Major Issues and Driving Forces

1. Major Issues

The federal agencies face several major issues as they move forward to modernize and expand their information systems. These issues are shown in Exhibit IV-1. Cost containment will be a key issue to the government agencies due to the combined pressures of Congress and the continuing slowdown in R&D expenditures that was initiated during the defense department spending freeze imposed in 1988. Many small vendors that had federal contracts experienced a reduction in profits. Also, to keep costs within the government's control, competitors are now required or encouraged to submit fixed-price bids on most systems integration and IS upgrade projects.

EXHIBIT IV-1

FEDERAL GOVERNMENT SECTOR AGENCY ISSUES

- Cost Containment
- Acquisition Reforms
- Budget Deficit Control Measures
- Regulations Imposed on Agency
- Internal Agreement on Requirements
- Availability of Skilled Staff

Several new acquisition, management, and usage procedures have been incorporated into the Federal Information Resource Management Regulations (FIRMRs) and others are still pending. The reforms are intended to streamline the purchasing process while improving the amount of competition. A number of improvement initiatives underway already include:

- "GO FOR 12," a joint agency program to reduce the acquisition process to 12 months
- "TRAIL BOSS," a GSA program for increasing the acquisition authority of selected government program managers
- "FAR (Federal Acquisition Regulations) Streamline," a new initiative to further reduce the volume of the regulations and employ conventional business terminology

Budget deficit control, whether provided under the terms of the Gramm-Rudman-Hollings Act or direct congressional action, is expected to impact the rate and/or extent of IS modernization in the agencies. Continuing economic and political sensitivity to the large national budget deficit could negatively impact a number of acquisitions in the "less than critical" defense and civil technology sectors. Presidential election years (1988, 1992) often imply budgeting for political, not practical, reasons, thereby leading to budget cuts in fiscal year 1989 and fiscal year 1993. Major ADP systems already approved are likely to continue in preference to unapproved programs.

The complex and lengthy regulations imposed on the agencies are viewed by many as a severe impediment to systems acquisitions and software development. Combined with a lack of internal concurrence and management interest in extending information automation, these two issues are of concern to the agencies as they plan systems acquisitions and utilization of new information technology.

Furthermore, the federal government does not currently have the in-house staff required to support the quality or quantity of ADP-supported services demanded by the Congress and by the American people. The agencies' personnel policies contain outdated standards and job descriptions and impose severe administrative problems. Some resolutions to these problems are being developed. Currently, agencies are working with the Office of Personnel Management to upgrade procurement professionals and give greater support for contracting personnel.

2. Driving Forces

The driving forces behind the federal market for information systems are summarized in Exhibit IV-2. The federal government was the first wide-based employer of large data processing capabilities. Despite an inventory in excess of 14,000 systems, current IS resources are experiencing difficulty in meeting rising service demands. The reasons are:

EXHIBIT IV-2

FEDERAL GOVERNMENT SECTOR DRIVING FORCES

- Rising Service Demands
- Equipment Obsolescence
- High Maintenance Costs
- End-User Computing Needs
- Connectivity Requirements
- Improved Security/Privacy Demands
- Presidential Priority Programs

- Public service functions, such as social security, welfare, and health and human services, continue to escalate under congressional initiatives.
- Congress needs newer, more frequent, and more timely data and analyses from the departments and agencies it oversees.
- Administrative initiatives continue to uncover areas of executive branch information processing that are missing or inadequate to meet new management expectations.

Though not as pronounced as in the early 1980s, the ADP Equipment (ADPE) inventory includes a significant number of early third-generation machines that lack the flexibility, speed, and capacity of currently available technologies.

The combination of older ADPE and a very large inventory of custom software has driven maintenance costs up and extended repair times. GAO and NBS have estimated that about 70% of software life cycle costs go to maintenance and enhancement, and tie down an inordinate percentage of in-house IS staff.

Government personnel and managers requiring data processing support through end-user computing need dynamic response from data centers. Both volume and complexity are increasing, along with demands for more user-friendly computing support.

The need to share data under the constraints of the Paperwork Reduction Act and to interact to meet administration requirements, including the Reform '88, CALS, and SDI initiatives, will require substantially improved connectivity. New standards are needed for uniform protocols, open system architectures, and standard systems interconnections.

Administrative and congressional demands for improved security measures raise both national security and individual privacy protection issues. Congress is also considering new computer theft and proprietary data protection measures, which will affect both commercial and individual privacy, as well as national security.

The large number of new and replacement information systems in the procurement process required a priority process to assure completion of those associated with key administrative initiatives. In the fiscal year 1988 Report on Management of the United States Government, 15 systems have been designated "Presidential Priority Systems." In addition, 12 more systems have been designated as Future Priority Systems, which are committed to meet industry standards by 1990.

B

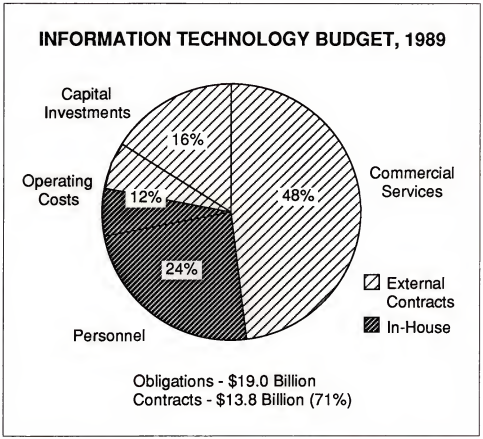
Information Technology Budget Analysis

The annual information systems (IS) budget (referred to as Information Technology in the federal government) that supports the various federal department missions is categorized by the OMB A-11 Budget Process in terms of the basic components needed to acquire and operate IS, namely capital investments, commercial services, operating support, and personnel. These categories and their respective shares of the 1989 (IS) Information Technology Budget request (software, services, hardware, and systems) are displayed in Exhibit IV-3.

The types of activities supported under each of these categories are as follows:

- Capital Investments. The lease or purchase of all ADP equipment, telecommunications equipment, software, and physical facilities, excluding embedded computers and classified systems. (INPUT's report excludes physical facilities and equipment.)

EXHIBIT IV-3



- Commercial Services. Timesharing services, telecommunications services, facilities management, systems design and software development, consulting, software/hardware maintenance, education and training, and other external costs, including requirements analysis, risk analysis, and studies of advanced technology.

- Equipment Lease and Operating Costs. Day-to-day costs of operating information systems, including lease of hardware and software. (INPUT's report excludes all of this.)

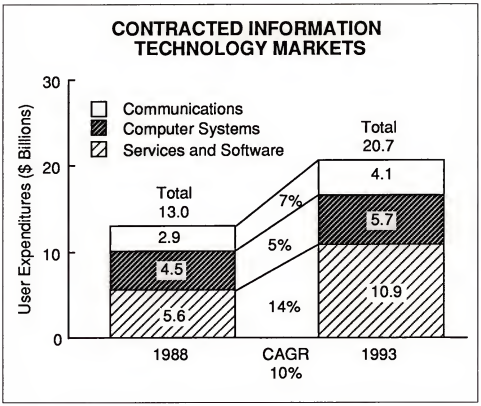
- Personnel. Salary, benefits, and travel costs associated with personnel employed directly by the government. (INPUT also excludes all of this.)

The 1989 IS budget of $19.6 billion represents 1.6% of the total government budget. This is about the same proportion as in 1988. In prior years (1982 to 1985), there was a 33% increase in this fraction.

Although the total IS budget has increased 47% in constant dollars since 1982, the period of rapid growth ended in 1985 with a 20% increase over the previous year. The 1988 increase over 1987 will be 4% in current dollars and unchanged in constant dollars.

Between 1988 and 1993 the contracted portion of the federal information systems budget is expected to grow from $13 billion to $20.7 billion, at a CAGR of 10%. This represents a slight increase over last year's forecast of 8% CAGR. The difference comes totally from the software and services market, which will grow 14% a year (Exhibit IV-4). Much of this spending results from cross-industry and site spending, which are not included in INPUT's industry-specific forecasts.

EXHIBIT IV-4



The forces behind this growth were discussed in Chapter II. In particular, the software and services market is being driven by:

- Greater functionality expectations by agency users
- Sharply reduced availability of technical specialists within the government
- Increased emphasis on standards, connectivity, and interoperability
- Greater pressure to contract work out, especially during Republican administrations

These factors will continue to drive the federal software and services market over the forecast period.

The federal market for computer systems will lag the growth of other areas. In particular, INPUT expects a dampening in the growth of demand for mainframe systems. Microcomputers are also beginning to reach a saturation point at some agencies. This demand is also expected to lag the market.

At the high end of the scale, INPUT expects brisk growth in the supercomputer market. First, traditional users, such as Energy, NASA, and some defense users will continue their demand. In addition, other users, particularly on the DoD side, are establishing supercomputer-based networks to solve non-traditional problems through greater resource sharing.

Telecommunications expenditures will increase as the government takes advantage of the new technology becoming available through the FTS 2000 initiative. Also, the greater need for information sharing will enhance the need for more sophisticated telecommunications features and services.

Various information systems budget items have experienced widely differing growth over the past two years (Exhibit IV-5). In several cases, projected expenditures for 1988 were not realized because of protests or other procurement problems. This shows up as negative growth in 1988. As the procurement problems abate, the year-to-year budget growth should smooth out.

EXHIBIT IV-5

INFORMATION SERVICES BUDGET DISTRIBUTION AND GROWTH (Percent)

Budget Category	Annual Budget		Year-to-Year Budget Growth	
	1987 Budget	1988 Budget	1987-1988	1988-1989
Personnel	22.5	21.8	(5.2)	5.8
Hardware				
- Mainframes	6.1	6.4	4.9	6.1
- Minicomputers	3.2	2.6	(11.4)	7.2
- Micros	1.1	0.9	(11.2)	5.1
- Mass Storage	2.2	2.1	2.3	—
- Other	9.3	8.1	(12.9)	(1.5)
Total Hardware	21.9	20.1	(2.9)	6.0
Communications*	5.8	15.4	25.8	7.9
External Products & Services				
- Prof. Services	14.7	14.8	9.3	12.1
- Proc. Services	5.4	5.2	4.6	8.5
- Appl. Software	2.1	2.3	18.9	14.2
- Systems Software	1.5	1.5	8.6	8.0
- Turnkey Systems	4.4	4.3	6.1	6.8
- Software Maint.	0.9	0.8	(3.5)	0.1
- Hardware Maint.	8.5	8.4	7.3	8.0
- Other	5.2	2.0	(58.2)	10.1
Total External	42.4	39.3	.6	8.8
Other	7.3	3.4	(48.0)	9.1
Total Budget	100.0	100.0	8.6	8.9

* Sharp increase reflects changes in budget reporting by Defense Communications Agency.

C

Application Development Trends

The federal government sector's trends for applications are shown in Exhibit IV-6. This exhibit is compiled from the descriptions of selected federal information systems and services in INPUT's Procurement Analysis Reports (FISSP). The applications are classified as either from a civilian or defense agency, and include those from both large-scale and midsize computer systems that are to be acquired, upgraded, or replaced by federal agencies.

The civilian agencies sampled most often designated their large-scale information systems for information analysis, research, and mission support applications. However, these same civilian agencies targeted management systems, human resources, accounting, and word processing most frequently for midsize operations. Large systems are still emphasizing applications of a centralized nature. Midrange computers, or minicomputers, now play a vital role in the increasingly decentralized and networked environments in governmental user organizations. The federal user community is demanding powerful shared resources that can handle a myriad of department and data center functions.

Information analysis, scientific and engineering support, logistics, and mission support are the most frequent application areas for the defense agencies. For the midsize systems, logistics, along with word processing, graphics, and electronic mail comprise the largest categories of application areas. Specific technical applications, such as those identified as scientific, made up a rather small portion of applications run on DoD minicomputers.

Federal agencies are planning major upgrades of systems for human resources, management, graphics, and logistics and distribution applications. Part of this thrust reflects an increasing awareness by agency executives of the uses of their information. This is being shown particularly in the area of logistics. A significant portion of system upgrades by the defense agencies focuses on their existing systems that are to be upgraded with the CALS initiative rather than through acquiring new systems.

Replacement of systems is most noted in office automation, information analysis, and scientific/engineering applications where rapidly changing hardware technology continues to obsolete these systems at a fast pace. Some agencies have planned for new starts in the "traditional" areas of information analysis and administration. In general, these programs represent attempts to bring computer-based productivity improvements to the functional operations of the agency.

EXHIBIT IV-6

FEDERAL GOVERNMENT APPLICATION AREAS

Application	Proportion (%)			
	Civilian Agencies		Defense Agencies	
	Large-Scale Systems	Midsize Systems	Large-Scale Systems	Midsize Systems
Information Analysis	18	6	11	8
Research	18	—	5	—
Mission Support	14	—	7	—
Logistics and Distr.	4	—	16	12
Budget & Finance	11	—	12	—
Scientific/Engineering	10	6	18	4
Project Management	6	6	3	4
Administrative	2	9	3	4
Human Resources/Payroll	2	13	5	4
Word Processing	—	13	—	16
Electronic Mail	—	9	—	12
Electronic Publishing	—	9	—	8
Graphics	—	—	—	12
Accounting	—	13	7	8
Management Systems	—	16	5	8
Distributed Processing	4	—	5	—
Planning	2	—	3	—
Training	—	—	—	—
Other	9	—	—	—
Total	100	100	100	100

D
Objectives and Plans

1. IS Objectives

The objectives of the federal government sector are shown in Exhibit IV-7. Integration of voice, image, text, and data interchange within a single digital system is a key objective of GSA's FTS 2000 telecommunications project in the 1990s. An all-digital system would more readily permit encryption for security reasons and allow use of more-cost-effective fiber optic transmission methods. FTS 2000 is expected to be awarded in December 1988.

EXHIBIT IV-7

FEDERAL GOVERNMENT SECTOR OBJECTIVES

- Voice-Data Integration
- Improved End-User Support
- Increased Software Product Applications
- Relational Data Bases
- Departmental Information Processing
- Transparent Connectivity
- Decision Support Systems

Improved, user-friendly data processing resources are key objectives of most current systems projects. A primary objective is improved data base availability, with associated protective measures in both hardware and software that respond to end-user needs. Vendors to the federal market are becoming more aware of the government user's need to readily access data and distribute information among agency sites.

GAO, GSA, and NBS are pressing agencies to employ off-the-shelf or readily adaptable software products for a wide range of government applications that closely resemble commercial processes. Objectives include:

- Reduced software development time and cost
- Improved maintainability of software
- Improved transportability of applications between processors

There is increasing pressure for installation of relational data bases equipped with SQL to meet the data retrieval requirements of a widening community of end users, which may also include the public. Agencies have started to acquire 4GL packages as one means of offloading requests for ADP staff time.

The general concerns of potential government users of 4GLs are programmer productivity gains (during both the development phase and the maintenance cycle), performance and hardware resource considerations, and management issues. Frequently, the use of 4GLs, while improving programmer productivity, imposes an unacceptable burden on machine resources.

IS departmental processing emphasizes improvement of services to end users, with purchased products, improved and timely data bases, and technical support. Many of the federal government's midsize systems or department minicomputers are playing a vital role in the increasingly decentralized and networking environment of federal user organizations. The federal user community is demanding more-powerful computer resources that can handle the departmental and data center functions and also move into a distributed network environment.

Ultimately, current federal initiatives seek implementation of systems with transparent connectivity with users and other systems. Federal agencies are aiming for greater interoperability and connectivity throughout their information systems. One additional objective is the implementation of interface devices between office automation equipment and centralized data bases and other files. These will provide decision support systems to government executives. Also, developmental artificial intelligence efforts are incorporating new technologies that provide useful decision aids to improve productivity.

2. New Applications

The sheer volume of transactions and complexity of operations within the federal government sector require a constantly changing focus, as managers with an existing set of applications seek to apply new developments to a wide range of information service problems (Exhibit IV-8).

EXHIBIT IV-8

FEDERAL GOVERNMENT SECTOR NEW APPLICATIONS

- EDI - Networks and Services
- Computer-Aided Acquisition and Logistic Systems (CALS)
- Automated Tax Processing
- Standardized Financial, Payroll, and Personnel Systems
- AI Applied to Software Development and Simulation Modeling

Electronic Data Interchange (EDI) represents a key emerging application. It accelerates the accurate interchange of procurement, logistics, and other data, while improving the accuracy of these transactions. Since EDI uses conventional data processing and telecommunications capabilities, the emphasis in the federal sector will be development of vendor-furnished networks, software, and services to facilitate EDI implementation.

Currently, federal EDI is lagging behind the explosive growth of EDI in the commercial applications. With the exception of a few major programs, most EDI initiatives tend to be small pilot systems in which both government and vendors can assess costs.

The CALS (Computer-Aided Acquisition and Logistics Systems) Initiative of the Defense Department and NASA is a new application of automation of logistics to accomplish several goals:

- Integrate data life cycle elements in a source-to-use network
- Ensure compatibility of data interchange between logistic systems
- Automate the acquisition elements of:

- Stock order processing
- Shipping document generation and handling
- Inventory analysis
- Technical order (repair) system
- Technical manual and documentation generation on a demand basis

• Demonstrate the initial design characteristics and criteria via selected projects

• Involve industry and government in both the implementation and utilization of the systems

Each of the major DoD agencies is proceeding with a wide range of CALS-related initiatives. However, some vendors have expressed continuing concern over both data security and the lack of comprehensive standards. The DoD CALS policy office, in conjunction with the National Institute of Standards and Technology (formerly the National Bureau of Standards), is developing the necessary standards. However, considerably more must be done before the data security issues are resolved.

Automated tax processing applications are being developed on several fronts:

• Internal automation at the IRS Regional Centers, providing enhanced capabilities for:

- Rapid conversion of tax forms to electronic form

- On-line retention of several years' returns

- Automated analyses to select returns that need detailed auditing (rather than sampling methods)

- Automated preparation of refund payments

• External automation of the tax return process, allowing:

- Electronic filing of individual returns

- Electronic filing of small business returns involving more forms

- Electronic fund transfers for tax payment and refunds

After a succession of GAO (General Accounting Office) audits that identified increasing incompatibility and decreasing accuracy of financial, payroll, and personnel systems, OMB has directed conversion or replacement of these systems by all agencies.

- Financial systems must meet a single set of standards and produce compatible products by 1992 (the Joint Financial Management Improvement Program is playing a major role).

- Payroll systems must meet new accuracy and timeliness standards and be compatible within military and civilian agencies by 1990.

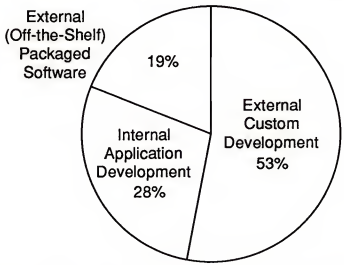
- Personnel systems must be upgraded to meet all of the EEO and privacy protection criteria by the early 1990s.

Artificial intelligence/expert systems applications are moving to near-term implementation and availability in several areas. The Department of Defense has several pilot projects and initial programs underway where AI can provide assistance to human control functions. AI is also being employed to develop models for a number of applications, including the automated tax audit system, gaming for military training simulators, and automated logistics processes. Furthermore, AI is being tested for use in development of applications software to include automated documentation generation and selection of alternatives that minimize future maintenance problems. However, surveys show that decision support systems, in a variety of administrative and scientific environments, continue to be the primary use of AI in the government.

The federal government continues to be heavily dependent on custom development of new applications, partly based on a perceived need for government-unique solutions, and partly based on continuing dependence on a large inventory of early third-generation processors. This heavy dependence on outside development sources is illustrated in Exhibit IV-9.

EXHIBIT IV-9

FEDERAL GOVERNMENT SECTOR SOURCES OF APPLICATION DEVELOPMENT



The externally developed, off-the-shelf software package source has been given a major impetus by the rapid growth of end-user personal computer use. Packaged software has also become available for minicomputers, of which the government has a large inventory. The share of application development by this source is expected to continue to grow.

Demands on the internal (in-house) IS staff to maintain older but critical custom software prevents them from assuming a greater role in developing new systems. GAO and NBS surveys have demonstrated that more than 70% of the software life cycle costs are expended on maintenance and undermanaged enhancements.

For now and the foreseeable future, the predominant source of major new application development will be external to the government. The majority of the development will come from professional services and software development firms. A smaller but very significant part of the development will come from universities and not-for-profit organizations, especially in AI, supercomputers, and automation applications.

3. Impact of Technology

Agency and industry representatives were asked to identify technological factors that would alter the federal government's spending for information services. The factors named most frequently are listed in Exhibit IV-10. These key technological areas were similarly ranked by all respondents.

EXHIBIT IV-10

FEDERAL GOVERNMENT SECTOR
IMPACT OF TECHNOLOGY

- New Optical Memory Technology
- Open System Architecture
- Artificial Intelligence/Expert Systems
- Supercomputer Improvements
- Digital Voice Systems

New optical memory technology, such as CD-ROM and large-scale laser disks, supports implementation of large personnel, financial, logistics, and maintenance systems to support a "less-paper" bureaucracy. Agencies are already seeking to procure optical disk storage systems as they attempt to upgrade their major information systems.

Open system architecture, long an objective of military systems that are assembled in building block fashion, will now become the standard in nonmilitary systems. Open systems improve the prospects of expansion and modification without requiring replacement of the basic processors. The issuance of a governmentwide policy for open system architecture would help to aggregate the market and establish consistency with commercial product development.

As stated in the previous section, artificial intelligence, or more specifically, expert systems, have already been employed in limited applications. New approaches that use AI include software development, process monitoring, and simulation. AI is also gaining in usage in tactical situations, automated planning, and support applications throughout DoD. However, as already indicated, decision support systems represent the most common federal application for AI. Some examples include photographic analysis for NASA, tax auditing for IRS, and eligibility verification for Social Security.

Each generation of supercomputer builds on the high performance characteristics of the last and incorporates advances in new architectures and processing mechanisms. Also adding to the design of the next generation machine are improvements in programming languages and other software developments that improve large-scale computer system computational abilities. The federal government's need for and support of research on supercomputers has been given additional impetus by the race with the Japanese, the demands for SDI processing, and the extended boundaries of physics and medical research.

Recent developments in microcomputer technology and voice recognition are offering new ways for entering data and encrypting voice communications for security purposes. A number of agencies need digital voice systems for authentication and operation in difficult environments. Agency executives look to improvements in this technology to improve security, making it more flexible and at the same time more cost-effective. However, INPUT does not expect any widespread acceptance of voice recognition systems, at least in the federal government, over the next few years.

V

Federal Market Opportunities

A

Application Targets

There are different application needs within an agency and between agencies. Several emerging application opportunities that should be targeted by vendors are listed in Exhibit V-1.

EXHIBIT V-1

FEDERAL GOVERNMENT MARKET APPLICATIONS TARGETS

- Management Information Systems
- Logistics Support
- Financial/Budgetary Management
- Scientific Computation Capabilities
- Office Systems End-User Support

Major opportunities exist for applications that provide new management information systems. These applications represent upgrades or expansions of capabilities relating to day-to-day operations of federal ADP and represent at least one-fifth of the different application needs of both civil and defense agencies.

In particular, many large agencies require project tracking systems to respond more rapidly to ad hoc queries from the Congress and various oversight agencies. Increasingly, agency executives require management systems for external as well as internal needs, to insure prompt reporting of project status.

Electronic Data Interchange (EDI) applications are emerging that will accelerate the interchange of procurement, logistics, and other data. EDI will emphasize development of software and network services as current pilot projects are implemented. General Electric, McDonnell Douglas, and Martin Marietta are supplying network services for the federal EDI market. There is no predominant software provider. Furthermore, EDI is unique in that it uses standard general-purpose business hardware.

Data management capabilities and data base management systems will become particularly popular as agencies attempt to organize their information resources to meet the ever-growing end-user demands. DoD agencies in particular will require applications in this area. For example, the Army is using ADR software for its ASIMS/VIABLE program. This use of ADR software with SQL has given them a major hold on the market. The four competitors with similar market penetration in other agencies include Oracle, IBI, CINCOM, and CULLINET.

Improvements to the federal government's administrative and logistics systems are required to bring these types of applications up to a level of efficiency realized in the commercial marketplace. The DoD has initiated the CALS program, which has drawn industry leaders such as CSC, General Electric, and TRW into the arena bidding for this large project. The civilian agencies seem to require even more support in this area of logistics, but may not do so on as large a scale as DoD.

With increasing congressional pressure on agencies to institute better money management practices, financial management and budget applications have also received greater priority, particularly in civilian agencies. As mentioned earlier, GSA's Joint Financial Management Improvement Program (JFMIP) has awarded contracts to American Management Systems and Computer Data Systems, Inc. for certain Core Compliant Software. However, additional vendors will be approved for supplying modifications to software packages for certain computer platforms.

Scientific applications are most prevalent in space exploration, energy, weapons development, and physical science projects of DoD, Commerce, NASA, and Energy. Currently, most scientific applications are being provided by vendors such as CSC, Boeing Computer Services, PRC, and several others that can provide programming, analysis, and large-scale support at individual agency centers.

Office automation applications, while commanding a smaller share of the various applications, should be particularly fruitful for vendors that offer solutions for the integration of incompatible hardware and the need for increased end-user support.

Little of the federal office systems market comes from contracts containing only the office systems Federal Supply Code (FSC 7435). Fifty times that amount comes from bundled contracts that include things other than office systems. Thus, the best application opportunities will come from those areas representing a variety of disciplines, rather than purely office systems.

B
Software Management

A particular concern surrounding these application targets is software management (Exhibit V-2).

EXHIBIT V-2

FEDERAL GOVERNMENT SOFTWARE MANAGEMENT ISSUES

- Transferability of Commercial Software Packages
- Government Preferences
- Compatibility/Conversion of Software
- Software Maintenance

The government has some unique data processing needs that require unique computer applications and software. Many federal computer technology applications are not, however, fundamentally different from those of the private sector and could use available commercial software packages with few, if any, changes.

The federal bias toward custom development has a high investment cost. Initial development of custom software is lengthy and labor intensive, and subsequent modification is difficult. Utilization of development tools and practices such as software engineering by vendors on government contracts will be emphasized.

Transition to more modern, efficient hardware is often inhibited by large inventories of customized software that require conversion. There are many cases where large, modern computer systems are configured to emulate older, less-capable computers so that existing custom software can be run without modification. Automated conversion techniques and cross compilers will be needed by conversion vendors to compete effectively in this market.

A decade ago the average life expectancy of a software application was three to five years. Today, five to eight years is considered average. Yet, many very large systems used by the federal government are more than twenty years old. Modern software engineering practices were not employed in the development of these older systems. As a result, they are very difficult and extremely expensive to maintain, yet vital to the proper functioning of an agency.

Some vendors will be contracted to provide appropriate transitions and maintenance of these systems. Others will provide flexible architectures for the identification and recovery of data in magnetic tape formats generated by systems and code versions no longer in use.

C

Turnkey Systems

There is a continuing interest by a number of agencies in the acquisition of turnkey, packaged ADP systems where the available applications, system configuration, delivery time, and/or cost best meet the agency's needs.

A careful analysis of agency needs can lead to identification of system requirements that can be met nearly or completely by off-the-shelf turnkey systems:

- Vehicle maintenance, overhaul, and replacement systems created for commercial truck, taxi, and rental car fleets are directly adaptable.
- Facility and maintenance resource scheduling systems are equally adaptable.
- Many three-dimensional graphics systems and indexing systems are directly applicable to agency needs.

With relatively minor modifications, a number of other commercial turnkey systems can be applied to a range of government needs:

- CAD/CAM systems are nearly universal.
- Warehousing and inventory locater systems can be readily adapted to government systems.

There are some government-unique applications that can be satisfied by either extensively modified commercial systems or systems devised for employment by several agencies:

- ADP-driven trainers for a range of vehicles and services, such as electronic system maintenance, will be required.
- Simulators related to those developed for arcades have applications in a number of civil and defense agency training facilities.
- Digital mapping systems, an extension of engineering graphics and topology, will be acquired by a number of agencies.

FG-A

Appendix: Forecast Data Base

This appendix contains the following forecast information, as shown in Exhibit FG-A-1.

- Market size by delivery mode for 1987-1993
- Market growth rates for 1987-1988
- Compound annual growth rate (CAGR) for each delivery mode for the five-year period 1988-1993

EXHIBIT FG-A-1

FEDERAL GOVERNMENT SECTOR FORECAST
USER EXPENDITURES BY DELIVERY MODE, 1987 - 1993
(IN MILLIONS OF DOLLARS)

Sector by Delivery Mode	1987	Percent Growth 87-88	1988	1989	1990	1991	1992	1993	Percent CAGR 88-93
Total Federal Government Sector	6,502	15	7,451	8,512	9,685	11,018	12,436	14,037	14
Processing Services	623	4	650	695	743	791	841	905	7
Transaction Processing Services	332	1	335	358	382	404	427	450	6
Systems Operations	292	8	315	337	361	387	414	455	8
Network/Electronic Information Services	675	26	853	943	1,033	1,137	1,250	1,376	10
Electronic Information Services	187	29	240	261	276	289	301	308	5
Network Applications	489	25	613	682	758	847	949	1,067	12
Application Software Products	184	25	230	262	299	341	388	439	14
Mainframe	54	11	60	65	72	79	86	94	9
Minicomputer	66	20	79	89	100	111	124	136	11
Workstation/PC	63	42	90	107	127	151	178	209	18
Turnkey Systems	368	6	389	423	457	490	522	555	7
Systems Integration	2,100	15	2,422	2,911	3,485	4,158	4,905	5,758	19
Professional Services	2,552	14	2,908	3,278	3,667	4,101	4531	5,004	11

FG-B

Appendix: Federal Government Sector Reconciliation

This section outlines the differences between the current forecast for the federal government industry sector and that provided in last year's vertical report. Where substantial differences occurred, the reasons for these changes are provided.

1. Processing Services

For 1987 the processing services total in this year's report ($620 million) was close to the estimate provided last year ($570 million). The growth rate projected over the next five years (7%) is somewhat higher than last year's 5% estimate. This firming in the processing services market comes from the growing popularity of new Multiple Award Schedule Contracts from GSA. Also, INPUT has observed some movement toward supercomputer-based networks, especially at NASA, the National Science Foundation, and the Energy Department. These are pushing the remote processing growth rate from the 3% projected last year to 6% this year. Actually, INPUT has observed a lowering of the rate for facilities management (systems operations), from 9% to 8%. Agencies have lowered their budget projections for dedicated systems, and this resulted in the lower growth rate.

2. Network/Electronic Information Services

This category was not included in last year's report, and therefore there is nothing to reconcile.

3. Turnkey Systems

The 1987 total for turnkey systems barely changed from last year's report. However, the CAGR for the next five years has been lowered from 9% to 7%. This change occurred despite a growth in CALS funding in the defense sector. The slightly lower growth rate occurred as a result of the growing popularity of cross-industry turnkey systems. Just as in

the application software products delivery mode (to be discussed next), OMB is encouraging agencies to adopt standard industry solutions. As a result, INPUT expects a slight dampening of the growth rate for government-specific turnkey systems.

4. Applications Software Products

This category showed the greatest change (in percentage terms) from last year's report. Last year, INPUT projected 1987 spending of $90 million. This year's report changed the 1987 estimate dramatically to $184 million. This change resulted from the following factors:

- GSA has sharply strengthened its program for analyst and programmer workbench tools. More vendors than expected are providing these tools, tailored to government needs.

- The Computer Security Act of 1988 has created a new growth industry in the government. Scores of companies are rushing out products to help agencies comply with the Act and associated NIST regulations.

- The federal financial software market is also changing. In January 1988, the Joint Financial Management Improvement Program (JFMIP) office issued a new document, the Core Financial Systems Report. OMB mandated its observance, and GSA issued a solicitation for Core-compliant software. Two contracts have been awarded so far, and more are expected in the next year. This is preventing agencies from using cross-industry financial software, and thus driving up demand for government-specific software.

5. Professional Services

At first glance the numbers appear to have changed drastically. Last year's report projected 1987 spending at $3.5 billion, while this year's report totals only $2.6 billion. However, the systems integration portion of professional services was backed out of this year's report, and included in a new category. Without this portion, last year's estimate would have been $2.5 billion. In this year's report all categories except education and training are higher, but only software development is significantly higher ($1,070 million vs. $950 million). Agencies spent more than expected last year because of procurement difficulties with new large systems. Agencies had to maintain and enhance their systems far more than expected, just to keep them going and comply with changing requirements. As new hardware systems are finally brought on-line, the old systems will be gradually released. However, many obsolete systems will continue well into the 1990s.

6. Systems Integration

The Professional Services portion of Systems Integration increased from $980 million in last year's report (for 1987) to $1,050 million in this year's report. This increase occurred as a result of growing federal dependence on system integrators. The out-migration of federal technical specialists was much worse than expected, as reported in a recent report from the Office of Personnel Management. As a result, more integration work needed to be contracted out, also increasing the totals. In addition, new programs for the FAA Air Traffic Control Automation and the NASA Space Station have been approved with off-budget funding, increasing the out year rate of growth in the 1990s. The other components of systems integration were not included in last year's report, and therefore no reconciliation is required.

About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

Continuous-information advisory services, proprietary research/consulting, merger/acquisition assistance, and multiclient studies are provided to users and vendors of information systems and services (software, processing services, turnkey systems, systems integration, professional services, communications, systems/software maintenance and support).

Many of INPUT's professional staff members have more than 20 years' experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed as a privately held corporation in 1974, INPUT has become a leading international research and consulting firm. Clients include more than 100 of the world's largest and most technically advanced companies.

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